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K-TL-535
Part 1

ORGDP HEALTH PHYSICS MONTHLY ACTIVITIES REPORT

JULY 1975

J. C. Bailey, R. J. Rodriguez, and L. H. Sipe
Health Physics, ORGDP

Laboratory Division

August 1975

UNION CARBIDE

OAK RIDGE GASEOUS DIFFUSION PLANT
OAK RIDGE, TENNESSEE

prepared for the U.S. ATOMIC ENERGY COMMISSION
under U.S. GOVERNMENT *Contract W-7405 eng 26*

HIGHLIGHTS

INTRODUCTION AND SUMMARY (Page 7). This is the first of a series of monthly activities reports that are intended to document the Oak Ridge Gaseous Diffusion Plant's (ORGDP) principal health physics activities.

LEAKING URANIUM HEXAFLUORIDE CYLINDER (Page 7). A leak in the wall of a 14-ton uranium hexafluoride (UF_6) cylinder was controlled with a pressure plate held in place with a lever hoist and pressure bands.

CASCADE IMPROVEMENT PROGRAM/CASCADE UPRATING PROGRAM RELATED ACTIVITIES (Page 8). Cascade Improvement Program/Cascade Uprating Program (CIP/CUP) health physics activities were directed primarily toward developing precise criteria for the shipment of motors to the contractor for rewinding.

PLANT PROCEDURES AND STANDARDS (Page 10). The issuance and implementation of five Standard Practice Procedures dealing with various aspects of radiation and radioactive contamination will greatly strengthen the ORGDP Health Physics Program.

RADIATION EXPOSURE TO PREGNANT WOMEN (Page 10). The control of radiation exposure to pregnant women was evaluated by ORGDP Health Physics in compliance with recently established U.S. Energy Research and Development Administration (ERDA) radiation standards, and provisions for controlling this radiation exposure were developed.

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ORGDP HEALTH PHYSICS MONTHLY ACTIVITIES REPORT, JULY 1975

INTRODUCTION AND SUMMARY

This is the first of a series of monthly activities reports that are intended to document the Oak Ridge Gaseous Diffusion Plant's (ORGDP) principal health physics activities.

DISCUSSION OF ACTIVITIES

LEAKING URANIUM HEXAFLUORIDE CYLINDER

A leak in the wall of a 14-ton uranium hexafluoride (UF_6) cylinder was controlled with a pressure plate held in place with a lever hoist and pressure bands.

During the annual inventory and cylinder examination on July 1, 1975, a UF_6 cylinder in the storage yard north of the cafeteria building was found to be leaking. A small crack was revealed in the weld on the upper surface of the cylinder adjacent to one of the stiffening rings. When this crack in the cylinder was found, the formation of UO_2F_2 had sealed the opening. Removal of the UO_2F_2 for the purpose of examining the crack resulted in the release of a small amount of UF_6. A fabric tape was applied over the area to stop seepage of the UF_6. On July 22, 1975, the cylinder was moved to K-1302. When the temporary tape and UO_2F_2 which had collected were removed, some further leakage of UF_6 occurred. Initial efforts to use a relatively firm neoprene gasket proved to be unsuccessful in stopping the leakage. However, when a sponge neoprene gasket was saturated with water and clamped in place, the seepage of UF_6 was successfully contained, presumably as a result of the rapid formation of an effective UO_2F_2 plug.

The cylinder was later transferred to K-1131 for disposal of its contents after a pressure of 3 psia continued to be maintained.

SPECIAL X-RAY MACHINE EVALUATION

A radiation survey around the Medical Department's X-ray room showed that construction workers who will be involved in a building remodeling program could not receive significant radiation exposure in those areas subject to entry for this construction work.

Three different locations outside of the X-ray room were checked with a Cutie Pie radiation meter--basement, attic, and outside of the window. The window is located on the wall where there is no lead-shielding protection. In practice, the X-ray beam is not directed toward this wall. The maximum readings that were obtained, the exposure times for evaluation, and the X-ray machine settings are presented in Table 1. The doses per routine exposure (0.15 sec) and the maximum possible exposure a construction worker at the location in question could get per quarter, assuming 12 exposures per day, are also given in Table 1.

Table 1

MAXIMUM POSSIBLE X-RAY EXPOSURE
FOR PERSONNEL OUTSIDE X-RAY ROOM, K-1003

Position of X-Ray Machine	mA	kV	Exposure Time For Evaluation, sec	Maximum Reading, mr/hr	Position of Meter (Cutie Pie)	Dose Per Routine Exposure, mr	Maximum Possible Exposure Per Quarter, mr
5° Off Horizontal (Toward Window)	100	84	2	60	Outside	2.5×10^{-3}	1.95
Straight Toward Window[a]	100	84	2	3,000	Outside	0.125	97.5
Down Through Table	100	84	2	220	Basement	9.2×10^{-3}	7.15
Normal Chest X-ray	100	84	3	40	Attic	1.7×10^{-3}	1.3

[a]Never an operational procedure; only for experiment

CASCADE IMPROVEMENT PROGRAM/CASCADE UPRATING PROGRAM RELATED ACTIVITIES

Cascade Improvement Program/Cascade Uprating Program (CIP/CUP) health physics activities were directed primarily toward developing precise criteria for the shipment of motors to the contractor for rewinding.

An ORGDP health physics representative assisted in the preparation of a statement supporting the proposed in-house decontamination of motors prior to shipment. Representatives of three gaseous diffusion plant sites met at the Portsmouth Plant to define facility, labor, and radiation monitoring requirements for the preparation of motors for shipment to the contractor for rewinding. In addition, at the request of the Union Carbide Purchasing Division, an ORGDP health physics representative met with the safety director of the National Electric Coil Co., the successful bidder on the contract for rewinding motors, to assist in the preparation of a Kentucky State licensing request.

INCIDENT REPORTS

On July 7, 1975 at 5:30 a.m., two employees were exposed to gaseous UF_6 in K-1004-C; the exposures were insignificant in terms of a radiological health hazard.

The incident occurred during the heating of a sample tube in hot water for homogenization; about 15 g of UF_6 suddenly started leaking through the valve into the hood and room.

Urine samples were taken at three different times after the employees' exposure--1/2 hr, 3 hr, and 26 hr--and the exposure was calcuated for each of the given times and averaged. The higher of the two exposures corresponded to exposure for one week to only 6% of the U.S. Energy Research and Development Administration (ERDA) radiation standard for airborne uranium, and was thus not significant in terms of a health hazard.

EMERGENCY PLANNING

The portal monitoring and personnel decontamination activities planned for handling a possible criticality accident were simulated in a plant emergency drill. The plant emergency squads, the Medical Department, and persons serving as observers were involved.

CESIUM-137 CLEANUP

Contamination from a release of the gamma emitter cesium-137 north of K-1405 was cleaned up.

On May 1, 1975, the ORGDP Environmental Protection Group reported to Health Physics that a helicopter radiation survey of ORGDP conducted under the auspices of ERDA had shown presence of relatively high levels of cesium-137 gamma radiation in the vicinity of K-1405. ORGDP Health Physics verified the presence of this radiation and found a maximum reading of 250 mr/hr at ground surface. Analyses of soil samples from the area verified the presence of cesium-137 gamma emitter and also showed the presence of trace quantities of the plutonium-239 isotope. Removal of the contaminated soil was initiated and, at final cleanup, about 350 yd^3 had been removed from five different localized areas. The soil with the greatest amounts of radioactivity, removed in the first stage of cleanup, was packaged in sealed 30-gal drums. The remaining soil was placed on plastic sheeting in dump trucks and the plastic was tied so as to completely contain all the material. This soil was taken to the Oak Ridge National Laboratory (ORNL) for burial in the established burial area. Gamma radiation in the area was reduced to essentially background level.

Calculations and measurements on the soil indicated a total of about 300 mCi of cesium-137 and 18 μCi of plutonium-239. Calculations showed that if this amount of each of the respective isotopes was discharged directly to Poplar Creek in a single day, the average concentrations would amount to only 0.00067% of the ERDA radiation standard for plutonium-239 in water discharged to public streams with a corresponding figure of 2.3% for cesium-137. Thus, no potential radiological hazard to the public is indicated.

Cleanup of the area is complete; the excavations are yet to be filled.

TRAINING AND EVALUATION

Seven 1-hr meetings on basic health physics concepts and radiation protection practices were held with 344 employees in the K-1401 shops of the Fabrication and Maintenance Division. One supervisory training class was also given an orientation in health physics topics. Material covered in these meetings was reviewed with the Operations Division supervision in preparation for a series of similar training sessions with their employees.

PLANT PROCEDURES AND STANDARDS

The following four Standard Practice Procedures were prepared for final issuance: SPP-B-309, *Scrap Metal Control Program*; SPP-B-315, *Labeling for Radiation and Radioactive Contamination Control*; SPP-B-379, *Radiation Control and Reporting*; and SPP-B-382, *Transfer Regulations Pertaining to Radioactive Contamination*.

An additional Standard Practice Procedure on X-ray equipment and radiation sources was adapted from existing Y-12 procedures and will soon be ready for review.

A report, K-TL-522, *Proposed Contamination Guides for Plant Equipment*, which presents the rationale for changing plant contamination limits on equipment from 500 c/m/100 cm^2 surface reading and 100 c/m/100 cm^2 transferable contamination to 2500 c/m/100 cm^2 and 500 c/m/100 cm^2, respectively, was transmitted to ERDA as a request for formal approval of the new limits.

RADIATION EXPOSURE TO PREGNANT WOMEN

The control of radiation exposure to pregnant women was evaluated by ORGDP Health Physics in compliance with a recently established ERDA radiation standard, and provisions for controlling this radiation exposure were developed. The ERDA radiation standard was changed to restrict radiation exposure to the fetus to 500 mrem during the course of pregnancy. This change was made as a safeguard against radiation exposure to the fetus, since studies have indicated that the fetus is more susceptible to radiation effects than is an adult.

The Medical Department will offer guidance to the employee and her supervisor at the time she reports her pregnancy to the Medical Department as required by plant regulations. Health Physics will also give guidance as needed.

The controls to be effected include exclusion of pregnant women from those areas involving radiographic operations, areas where frequent UF_6 cylinder connections and disconnections are made, and areas in the cascade buildings where maintenance work involving entry into the UF_6 system is in progress.

REFERENCE INFORMATION

Review of pertinent regulations, codes, and standards was initiated to update reference information for the Health Physics staff and Plant supervision.

OUTSIDE REQUESTS FOR INFORMATION

Health Physics is complying with a request made by the ERDA Health Protection Branch for any available health physics information on the aluminum melting operation carried out in K-1420 during the period from 1962 to 1964.

SPECIAL REQUEST SURVEYS

Fourteen surveys and/or equipment radiation checks were performed in the plant.

URINALYSIS PROGRAM

One hundred eighty-five urine samples were sent to the Hygiene Analysis Laboratory for uranium mass and alpha activity determinations. Analyses of 116 of the 185 samples have been completed. One sample exceeded the plant action guide, this one being the result of the UF_6 release reported earlier.

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K-TL-535
Part 2

ORGDP HEALTH PHYSICS MONTHLY ACTIVITIES REPORT

AUGUST 1975

J. C. Bailey, R. J. Rodriguez, and L. H. Sipe
Health Physics, ORGDP

Laboratory Division

September 1975

UNION CARBIDE

OAK RIDGE GASEOUS DIFFUSION PLANT
OAK RIDGE, TENNESSEE

prepared for the U.S. ATOMIC ENERGY COMMISSION
under U.S. GOVERNMENT *Contract W-7405 eng 26*

HIGHLIGHTS

CASCADE IMPROVEMENT PROGRAM/CASCADE UPRATING PROGRAM ACTIVITIES (Page 7). Special emphasis was placed on Kentucky's licensing of the National Electric Coil Co. (NECC) for receipt of motors, and on the preparation of motors for shipment.

X-RAY GENERATOR EVALUATION (Page 7). A review was made of all X-ray generators and isotopic sources (over 50 μCi) to determine features which would be necessary to meet applicable radiation safety standards.

CONTRACTOR ORIENTATION (Page 8). Rust Engineering Co. supervision was apprised of special health physics requirements in preparation for work to be performed in K-310-2. This will mark the first time that a contractor has removed or cut into cascade equipment.

EVALUATION OF CONTAMINATION GUIDES (Page 8). A detailed analysis of uranium intake resulting from the transferable fraction of uranium contamination on equipment surfaces indicated that, at the limits proposed, transferable contamination represents a smaller potential for uranium intake than does surface contamination, when the latter is affected by welding, grinding, and burning operations.

EXPANDED HEALTH PHYSICS SERVICES (Page 9). Three employees were added to the ORGDP-Health Physics staff to supply more comprehensive monitoring services to plant groups.

CONTENTS

ORGDP HEALTH PHYSICS MONTHLY ACTIVITIES REPORT, AUGUST 1975

INTRODUCTION AND SUMMARY

The purpose of this report is to summarize the Oak Ridge Gaseous Diffusion Plant's (ORGDP) Health Physics (HP) activities. The ORGDP-HP ensures that exposures of persons to ionizing radiations or radioactive materials associated with ORGDP operations are maintained to levels as low as is practicable, and *always* below applicable radiation protection guide values. This is accomplished through evaluation of exposure levels and potentials with appropriate recommendations to plant management.

The August activities included mainly subcontractor orientation for Cascade Improvement Program/Cascade Uprating Program (CIP/CUP) work, training, transferable contamination guides, and surveys of penetrating-radiation sources.

DISCUSSION OF ACTIVITIES

CASCADE IMPROVEMENT PROGRAM/CASCADE UPRATING PROGRAM ACTIVITIES

Special emphasis was placed on Kentucky's licensing of the National Electric Coil Co. (NECC) for receipt of motors, and on the preparation of motors for shipment.

A representative of HP, along with representatives of the Purchasing Division and the Law Department, visited NECC in Louisville, Kentucky to discuss with them and their health physics consultants details of the techniques for handling the small quantities of uranium expected to be present in the motors. Information, regarding contamination potentials that might result in the event that some of the motors were involved in a fire, was transmitted from HP through Purchasing to NECC, to aid in obtaining the Kentucky State license. Eight individual end bells and two complete motors were cleared by HP for shipment to NECC.

A series of studies has been initiated by Electrical Engineering in cooperation with HP to determine the effectiveness of degreasing assembled motors as a decontamination process. This involves disassembly, detailed monitoring, reassembly, degreasing, blowing out loose material, and final disassembly for monitoring. Two motors processed to date met requirements for shipment to NECC without any further decontamination.

X-RAY GENERATOR EVALUATION

A review was made of all X-ray generators and isotopic sources (over 50 μCi) to determine features which would be necessary to meet applicable radiation safety standards.

A team of two electrical engineers from Y-12, who are experienced in safety evaluation of X-ray generating devices and radiation source installations, reviewed ORGDP equipment at the request of HP. This review will provide

a basis for including any necessary safety features not presently in use. The comprehensive Y-12 Plant standards were selected as a basis for the initial X-ray machine evaluation.

TRANSURANIC-TRAP MAINTENANCE

Because of difficulties experienced with low uranium hexafluoride (UF_6) flow rates through the transuranic-trapping system at the K-33 Feed Room, some of the equipment is to be opened or removed for inspection. Detailed plans for HP monitoring and contamination control were developed jointly by K-32 supervision and HP. During such operations, special efforts will be made to determine the distribution and characteristics of transuranics in the system. Highly conservative protective measures will be used during such operations to ensure adequate control of personnel exposure to any transuranic deposits that may occur.

TRAINING AND EMPLOYEE EDUCATION

Reference information regarding basic radiation concepts, including biological effects of radiation and instrumentation, was assembled for utilization in a proposed HP manual for ORGDP.

CONTRACTOR ORIENTATION

Rust Engineering Co. supervision was apprised of the health physics aspects of the removal of equipment items from the cascade in a preconstruction meeting on work to be performed in the K-310-2 building. Subsequently, employees who are to be involved in this work were given a 1-hr orientation on health physics requirements for the job. An official statement regarding health physics requirements for this work was prepared by HP for transmittal to Rust Engineering Co. by ORGDP Construction Engineering.

The performance of this work involving entry into the cascade by Rust Engineering Co. employees will be the first time that contractor personnel have done this type of work.

EVALUATION OF CONTAMINATION GUIDES

A detailed analysis of uranium intake resulting from the transferable fraction of uranium contamination on equipment surfaces indicated that at the limits proposed, transferable contamination represents a smaller potential for uranium intake than does surface contamination, when the latter is affected by welding, grinding, or burning operations.

A detailed analysis of the magnitude of uranium intake by shop employees as a result of transferable uranium contamination on equipment surfaces was completed. The possible impact on personnel intake associated with the proposed change in the contamination guide for transferable contamination from 100 to 500 counts/min/100 cm^2 was also examined in detail.

A report of these studies was prepared as a supplement to the report K-TL-522, *Proposed Contamination Guides for Plant Equipment.*

EXPANDED HEALTH PHYSICS SERVICES

Three employees were added to the ORGDP-HP staff. In the immediate future, HP will be able to supply more comprehensive monitoring services for plant groups and will assume responsibility for all official radiation safety surveys, including the monitoring of equipment and materials leaving the plant.

INCIDENT REPORTS

Unidentified Container of Radioactive Material

Investigation by HP of the material in a partially filled 55-gal drum in the K-1064 salvage yard showed traces of alpha activity. The substance was apparently vermiculite.

The drum was discovered during a sampling program for liquid waste at the K-1064 salvage yard. The only identification of its content was the word *radioactive*, stenciled on the side of the drum.

The provisions of SPP B-315, *Labeling for Radiation and Radioactive Contamination Control*, which is now scheduled for distribution, should assist in improving the identity of stored materials in the future.

Personnel Exposure

An employee in the K-413 Product Withdrawal Building received possible exposure to UF_6 when the pinched point in an attached pigtail of a cylinder valve leaked. The standard safety procedure in such a case is to pinch the attached pigtail closed and remove the cylinder, with pigtail in place, to an outside location where it is allowed to cool before replacing the valve. In this case the pinched point was not completely closed, and a small amount of UF_6 escaped. Analysis of a urine sample, taken the same morning, indicated the exposure amounted to 3.6% of the radiation standard established by the United States Energy Research and Development Administration (ERDA) for airborne uranium for one quarter and was not significant in terms of a health hazard.

SPECIAL REQUEST SURVEYS

A total of 26 surveys and equipment radiation checks were performed by HP. The equipment included items for shipment to the Y-12 Plant, Paducah, and NECC.

URINALYSIS PROGRAM

Two hundred and twenty-seven urine samples were sent to the Hygiene Analysis Laboratory for uranium mass and alpha activity determinations, and 186 analyses were completed and reported. Two of these samples exceeded the plant action guide for uranium alpha activity and/or uranium. One was a routine sample submitted by a chemical operator whose work assignment involved sampling UF_6 cylinders in K-1423 and K-413. A specific source or

time of exposure could not be determined. The follow-up urine sample was below the plant action level, indicating no significant body retention of uranium. The second sample was associated with the UF_6 incident in K-413 reported earlier.

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Part 3

ORGDP HEALTH PHYSICS MONTHLY ACTIVITIES REPORT FOR SEPTEMBER 1975

J. C. Bailey, R. J. Rodriguez, and L. H. Sipe
ORGDP Health Physics

Laboratory Division

October 29, 1975

UNION CARBIDE

OAK RIDGE GASEOUS DIFFUSION PLANT
OAK RIDGE, TENNESSEE

prepared for the **U.S. ENERGY RESEARCH AND DEVELOPMENT ADMINISTRATION**
under **U.S. GOVERNMENT** *Contract W-7405 eng 26*

HIGHLIGHTS

TRANSURANIC TRAP MAINTENANCE (Page 4). Samples from the transuranic trap lines in the K-33 Feed Room were analyzed and found to be free of transuranics.

CONVERTER SPOOL PIECE DISMANTLING (Page 4). The uranium in the hollow struts in the converter spool pieces presents a potential for high airborne and surface contamination when these struts are cut into pieces. Removal of the struts intact reduces the contaminant problems.

CESIUM-137 CLEANUP (Page 4). The areas excavated during the cesium-137 cleanup have been earth filled, and the surfaces of these areas now show no radiation reading higher than the background level.

CONTAMINATION IN PROCESS DUCTS (Page 5). Probable contamination inside cascade building ventilation ducts cannot be evaluated precisely prior to opening the ducts. Therefore, work by a lump sum contractor in connection with the Cascade Improvement and Cascade Uprating Programs is precluded.

K-310-2.7 EQUIPMENT MODIFICATION (Page 6). Equipment was removed by Rust Engineering Co. employees from K-310-2.7 with no significant health physics problems.

RUPTURED CYLINDER AT TOLL ENRICHMENT FACILITY (Page 6). The highest exposure indicated by urine samples taken from persons who were in the vicinity of K-1423 following a cylinder leak was equivalent to only 17% of the U.S. Energy Research and Development Administration standard for one quarter.

TRAINING (Page 6). One hundred and sixty-one employees of the Fabrication and Maintenance and the Finance and Materials Divisions participated in health physics training sessions conducted by ORGDP-Health Physics personnel.

RADIATION SURVEY INSTRUMENT REVIEW (Page 6). Recently developed specifications for an alpha survey meter with digital readout were issued to instrument manufacturers along with a preliminary inquiry for fabrication.

ROUTINE AND SPECIAL REQUEST SURVEYS (Page 7). A total of 2723 items was surveyed and tagged at K-1420 following decontamination.

OFF-SITE TRANSFER OF CONTAMINATED SCRAP (Page 7). Two pieces of equipment that had been sold as salvage were found to be slightly contaminated and were returned to the Oak Ridge Gaseous Diffusion Plant (ORGDP) for cleaning.

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ORGDP HEALTH PHYSICS MONTHLY ACTIVITIES REPORT, SEPTEMBER 1975

INTRODUCTION AND SUMMARY

This monthly report summarizes the Oak Ridge Gaseous Diffusion Plant's (ORGDP) Health Physics (HP) activities. The ORGDP-HP goal is to ensure that exposures of persons to radioactive materials or ionizing radiations associated with ORGDP operations are as low as is practicable, and below applicable radiation protection guide values. This is accomplished through evaluation of exposure levels and potentials, with appropriate recommendations to plant management.

Principal activities for this month included health physics guidance for a transuranic trap system, converter spool piece dismantling operations, process ventilation duct contamination as related to contractor operations, and the K-1423 uranium hexafluoride (UF_6) cylinder rupture evaluation. Plant and equipment monitoring activities also increased.

DISCUSSION OF ACTIVITIES

TRANSURANIC TRAP MAINTENANCE

Initial sampling of materials in the transuranic trap system in the K-33 Feed Room was carried out. Analyses of samples taken from trap lines between Traps 3 and 4 and the sintered metal filter were analyzed and found to be free of transuranics. Further activities related to the traps will continue to be closely monitored for adequate control of personnel exposure to any transuranic deposits that may be present.

CONVERTER SPOOL PIECE DISMANTLING

The presence of relatively massive deposits of uranium materials in the hollow struts which run lengthwise in the converter spool pieces presents a potential for the dispersal of very high-level airborne contamination and heavy surface contamination during converter dismantling operations. In the intial dismantling, the struts were cut into short lengths with a torch, and significant airborne and surface contamination levels resulted. The present practice of removing the struts intact greatly reduces the contaminant problems.

CESIUM-137 CLEANUP

The soil areas excavated during the cesium-137 cleanup reported in the ORGDP-HP Monthly Activities Report for July 1975 were filled, and the surface was reseeded. A final radiation survey of the soil surface showed no readings above the background level.

LITERATURE SEARCH

At the request of ORGDP-HP, the ORGDP Library Staff initiated a literature search for information relating to the absorption of uranium through the intact skin. For this purpose, the RECON computerized information retrieval system based at the Holifield National Laboratory (HNL) was utilized. Only the previously recognized studies which were carried out at the University of Rochester were found in the search.

RADIATION ALARM EVALUATION

A series of neutron detector tests will be conducted at the HNL-HP Research Reactor under the auspices of the Nuclear Safety Department in conjunction with the International Nuclear Accident Dosimetry Intercomparison Studies which are to be carried out in October. The response of several of the neutron detector clusters which actuate the nuclear criticality alarm systems will be measured. The ORGDP-HP is assisting in providing independent dosimeters and other test support.

CASCADE IMPROVEMENT AND UPRATING PROGRAMS

Contamination in Process Ducts

Probable contamination inside cascade building ventilation ducts which are to undergo extensive modification in connection with the Cascade Improvement and Cascade Uprating Programs (CIP/CUP) has been reviewed. The review indicates that personnel involved in the duct modification may encounter contamination conditions which cannot be evaluated precisely prior to opening the ducts. This possibility precludes performance of the work by a lump sum contractor.

Motor Cleaning

A representative of ORGDP-HP participated in discussions directed toward the development of criteria for motor cleaning and decontamination for submission to National Electric Coil Co. The possiblity of amending the contract for motor rewinding without cleaning the motors at the diffusion plants, and the development of the related criteria, are under the auspices of the Plant Equipment Modification (PEM)/CUP Engineering Department.

Cell Changeout - K-902-4.4

The K-902-4.4 cell changeout was made with no significant health physics problems or personnel exposure. Surveys of the area prior to and following equipment removal indicated no significant uranium contamination. Air samples taken during cutting and equipment removal operations showed air contamination to be below the limits of the plant radiation protection standard. Urinalysis evaluations for 17 of the employees involved in the work were all below the plant action limit.

K-310-2.7 EQUIPMENT MODIFICATION

Equipment was removed by Rust Engineering Co. employees from K-310-2.7 with no significant health physics problems. Small quantities of uranium mateials encountered in this work were removed by Carbide personnel. Concern expressed by Rust employees prompted additional discussions and on-the-job orientation with respect to uranium handling methods. As noted last month, this is the first time a contractor has cut into cascade equipment.

RUPTURED CYLINDER AT TOLL ENRICHMENT FACILITY

The persons, who were in the vicinity of a UF_6 release resulting from the partial rupture of a UF_6 cylinder at K-1423, submitted samples for urinalysis evaluation, and the ORGDP-HP surveyed the area in the vicinity of the cylinder. This incident is now the subject of a formal investigation under the direction of the Operations Division.

TRAINING

Eighty employess of the Mechanical Services Department participated in a 1-hr HP training session conducted by ORGDP-HP personnel. Three additional sessions provided similar instructions for 81 employees of the Stores Department. One supervisory training class was also instructed in health physics topics.

RADIATION SURVEY INSTRUMENT REVIEW

A committee made up of representatives from ORGDP-HP, Operations, and Instrument Maintenance reviewed the status of radiation instruments at ORGDP. The need for a digital readout alpha survey meter was recognized, and ORGDP-HP has developed specifications for such an instrument. These specifications have been transmitted to instrument manufacturers to determine their interest in providing such an instrument. A draft report of the committee's review has been prepared.

URINALYSIS PROGRAM

Three hundred and thirty-four urine samples were sent to the Hygiene Analysis Laboratory for uranium mass and alpha activity determinations, and 359 analyses, including some carried over from August, were completed and reported. Thirty-one of these samples exceeded the plant action guide for uranium alpha activity and/or uranium. The highest indicated exposure was equivalent to inhalation of airborne uranium for one quarter at only 17% of the U.S. Energy Research and Development Administration (ERDA) Radiation Protection Standard.

ROUTINE AND SPECIAL REQUEST SURVEYS

Seventy-two field surveys and radiation checks were performed by ORGDP-HP. In addition, 2723 pieces of decontaminated equipment or material were checked and tagged at K-1420 by ORGDP-HP personnel.

RELOCATION

On September 10 the ORGDP-HP Section moved from K-1004-A to a mobile office building, K-1570B, immediately north of Portal 4. The ORGDP-HP telephone number 3-3200 was retained; but radiation surveys, under the supervision of Loy Sipe, can now be obtained by calling 3-9461 or 3-9462.

OFF-SITE TRANSFER OF CONTAMINATED SCRAP

Two Valley Iron pumps from the K-27 side-purge system were sold as scrap. Upon dismantling of the pumps, the purchaser requested a health physics evaluation for possible uranium contamination. A survey carried out at the purchaser's site by ORGDP-HP showed all exterior surfaces of the pumps to be free of contamination, but one small area of an internal part revealed detectable alpha activity. Both pumps were returned to ORGDP for dismantling and cleaning.

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47-49. Paducah Plant
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Hopkins, C. C.
Levin, R. W.

50. Purchasing Division
Osborne, H. H.

51-54. Y-12 Plant
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Parks, C. J.
Vanstrum, P. R.
Zerby, C. D.

ChemRisk/Shonka Research Associates, Inc., Document Request Form

(This section to be completed by subcontractor requesting document)

J. Lamb / 1034A

Requestor / Document Center (is requested to provide the following document)

Date of request 9/14/95 Expected receipt of document 10/14/95

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K-TL-535
Part 4

ORGDP HEALTH PHYSICS MONTHLY ACTIVITIES REPORT FOR OCTOBER 1975

J. C. Bailey, R. J. Rodriguez, and L. H. Sipe
ORGDP Health Physics

Laboratory Division

November 26, 1975

UNION CARBIDE
OAK RIDGE GASEOUS DIFFUSION PLANT
OAK RIDGE, TENNESSEE

prepared for the **U.S. ENERGY RESEARCH AND DEVELOPMENT ADMINISTRATION**
under **U.S. GOVERNMENT** *Contract W-7405 eng 26*

HIGHLIGHTS

PROCESS VENTILATION DUCT EVALUATION (Page 4). The possibility of having Cascade Uprating Program process ventilation duct work performed by a lump-sum contractor is being reevaluated because of the low contamination found in a sampling of the ducts. Also, it is the opinion of the Oak Ridge Operations, Energy Research and Development Administration Health and Safety Branch, that low-level contamination should not preclude the use of lump-sum contractors.

EVALUATION OF CRITICALITY ACCIDENT UNITS (Page 5). Evaluations of the Oak Ridge Gaseous Diffusion Plant nuclear accident dosimeters, associated laboratory counting equipment, and the criticality radiation alarms, under critical accident conditions as simulated at the Holifield National Labatory Health Physics Research Reactor showed that these units were satisfactory.

RADIATION FROM A NUCLEAR EXCURSION (Page 5). Calculations of residual radiation anticipated after a nuclear accident have provided quantitative data for use as a reference when evaluating a possible future accident.

SPENT FUEL SHIPPING CASK (Page 6). Consideration is being given to plans for the proposed decontamination of a Westinghouse 75-ton spent reactor fuel shipping cask.

CONTENTS

ORGDP HEALTH PHYSICS MONTHLY ACTIVITIES REPORT FOR OCTOBER 1975

INTRODUCTION AND SUMMARY

This monthly report summarizes the Oak Ridge Gaseous Diffusion Plant's (ORGDP) Health Physics (HP) activities. The ORGDP-HP goal is to ensure that exposures of persons to radioactive material or ionizing radiation associated with ORGDP operations are as low as is practicable, and below applicable radiation protection guide values. This is accomplished through evaluation of exposure levels and potentials, with appropriate recommendations to plant management.

Principal ORGDP-HP activities included reevaluation of the possibility of performance of Cascade Uprating Program (CUP) work on process ventilation ducts by a lump-sum contractor, evaluations of the ORGDP nuclear accident dosimetry units and criticality radiation alarm units, calculation of residual radiation following a criticality accident, and preliminary considerations for the decontamination of a nuclear fuel shipping cask.

DISCUSSION OF ACTIVITIES

CASCADE IMPROVEMENT AND UPRATING PROGRAMS

Process Ventilation Duct Evaluation

A radiation survey of the process ventilation ducts in K-31 and K-33 showed that the inner surfaces of the ducts contained a negligible amount of contamination. The possible use of lump-sum contractors in CUP process ventilation duct work should not be precluded, since these ducts are essentially contamination-free.

The maximum interior surface contamination reading taken in the K-31 and K-33 ventilation ducts was only 250 counts/min/100 cm^2. The locations checked (through access ports) are believed to be in the most highly contaminated ducts in the K-31--K-33 complex because of a known history of uranium hexafluoride (UF_6) releases in these areas. Therefore, it is assumed that this negligible contamination is an indication that most of the ventilation ducts involved in the CUP are essentially free of contamination.

The ORO-ERDA Health and Safety Branch is considering the application of ERDA contamination limits that would permit more freedom in the assignment of work to contractors than did the former position that lump-sum contractors should not work where *any* contamination is present.

Motor Cleaning

A member of ORGDP-HP met with other representatives from ORGDP and management personnel from the National Electric Coil Co. (NECCO) to discuss the possibility of having motor cleaning done by NECCO. Interest in the

contamination levels is renewed because NECCO is preparing a proposal for carrying out the cleaning operation under an amended contract for motor uprating.

EMERGENCY PREPAREDNESS

Simulation of a criticality accident recently held at the Holifield National Laboratory Health Physics Research Reactor (HNL-HPRR) to test ORGDP nuclear accident dosimeters, criticality radiation alarms, and counting equipment showed that all of the units functioned satisfactorily. Calculations of residual radiation anticipated after a nuclear accident have provided quantitative data for use as a reference when evaluating a possible future accident.

Nuclear Accident Dosimeter Test

ORGDP participated at the annual international dosimetry intercomparison studies at HNL-HPRR. The results of measurements made by the Radioanalysis Section of the Isotopic Analysis Department, using nuclear accident dosimeters of the type employed at ORGDP, were in excellent agreement with values reported by HNL-HPRR personnel for the configurations of the tests.

Radiation Alarm Evaluation

Radiation alarm units of the type used at ORGDP for the detection of a possible criticality accident were field tested at the HNL-HPRR. The tests were made under the auspices of the Nuclear Safety Department. Actual testing was under the direction of ORGDP Instrumentation and Quality Assurance Development Department of the Gaseous Diffusion Development Division with assistance from the Instrument Maintenance Department, Equipment Test and Inspection, and ORGDP-HP.

All units tested under simulated criticality accident conditions responded satisfactorily. Details of response sensitivity, relative to the radiation fields, are being calculated.

Radiation From a Nuclear Excursion

Following the partial cylinder rupture at the K-1423 Toll Enrichment Facility on September 17, 1975, the question was raised as to whether the absence of detectable gamma radiation 24 hr after the incident was reliable evidence that the reaction in the cylinder was not nuclear in nature. Since no data directly applicable to this question were available, quantitative surface dose estimates were calculated under the auspices of ORGDP-HP for future reference.

The actual calculations* were made by William O. Hermann and John R. Knight of the Computer Sciences Division at HNL. Hermann used the ORIGIN computer

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*Rodriguez, R. J., *Residual Radiation From a Nuclear Excursion,* Union Carbide Corporation, Nuclear Division, Oak Ridge Gaseous Diffusion Plant, Oak Ridge, Tennessee (In Preparation). UNCLASSIFIED.

code to provide gamma energy distributions for fission products at various times after fission; and Knight utilized the output of these computations to make ANISN computer code calculations of dose rates. Values for surface dose rates are listed in Table 1.

Table 1

SURFACE GAMMA DOSE RATES FROM A NUCLEAR REACTION OF 3×10^{16} FISSIONS IN A URANIUM HEXAFLUORIDE CYLINDER

Time	Dose Rate at Surface
1 min	190 r/hr
1 hr	5.8 r/hr
24 hr	53 mr/hr
30 days	1.3 mr/hr
1 yr	0.015 mr/hr

It is evident that the 53-mr/hr level computed for 24 hr would be readily detectable with gamma survey instruments.

SPENT FUEL SHIPPING CASK

Consideration is being given to the proposed decontamination* of a Westinghouse 75-ton spent reactor fuel shipping cask currently located on the railroad siding in the powerhouse area of ORGDP. Surveys of the exterior of the cask indicated the presence of significant beta- and gamma-emitting fission products.

PERSONNEL MONITORING

Film Badges

Film badge results for the period April 1 - June 30, 1975 were reported during the month. No exposure exceeded the radiation protection guide limits of 3000 mRem/quarter for penetrating radiation or 10,000 mRem/quarter

*Hart, R. J., Letter to R. F. Hibbs, *Inspection and Decontamination of WECX-300, 75-Ton Yankee Spent Fuel Cask*, U.S. Energy Research and Development Administration, Oak Ridge, Tennessee, September 29, 1975.

for skin dose. The highest doses recorded were 184 mRem for penetrating and 630 mRem for skin doses.

Urinalysis

One hundred and twenty urine samples were sent to the Hygiene Analysis Laboratory for uranium mass and alpha activity determinations. Analyses of 164 samples, which included some from the previous month, were completed and reported. Seven of these samples exceeded the Plant Action Guide (PAG) limit for uranium mass and/or alpha activity. Five of the samples exceeding the PAG limit were from maintenance employees involved in a UF_6 release when starting removal of a control valve in K-31; the other two samples were from chemical operators in K-1423 who were involved in the transfer of a ruptured 2-1/2-ton cylinder* to K-29 on September 26, 1975. Follow-up urine samples from the two chemical operators were below the PAG limit, indicating that there was no significant body retention of uranium.

Follow-up samples taken subsequent to a known intake of uranium in a UF_6 release serve to assure that the initial sample results were actually due to intake of soluble uranium materials rather than insoluble compounds, such as uranium tetrafluoride, which may be detectable for months after a significant exposure. It is thus acceptable to defer for at least one month the follow-up sampling of the five maintenance employees, who have evidently not been subjected to exposure to insoluble uranium compounds, and were not available for immediate follow-up samples.

INCIDENT REPORTS

Two incidents involving the presence of visible quantities of UF_6 vapor during cascade maintenance operations were reported. On October 7, 1975, Carbide maintenance personnel were removing a process valve in K-602-5.7 and observed visible UF_6 *smoke* emerging from the cut. Several Rust employees were evacuated temporarily from K-602-2 and K-602-3 as a precautionary measure, although they were judged to be at a safe distance from the area involved. Urinalysis from Carbide employess working in the area indicated no significant intake of UF_6.

On October 10, 1975, during the removal of a process valve in K-602-3.2, a small release resulted in the detection of uranium in the urine samples of five employees. Urinalysis results are discussed above under *Personnel Monitoring*.

The occasional release of small quantities of UF_6 in maintenance work on cascade equipment occurs because complete purging of the systems cannot be assured, even when available tests for UF_6 in the system have been negative.

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*Bailey, J. C., Rodriguez, R. J., and Sipe, L. H., *ORGDP Health Physics Monthly Activities Report for September 1975*, Union Carbide Corporation, Nuclear Division, Oak Ridge Gaseous Diffusion Plant, Oak Ridge, Tennessee, October 29, 1975 (K-TL-535, Part 3). UNCLASSIFIED.

CONTRACTOR WORK

An area of approximately 25 ft^2 on the roof of K-1004-C laboratory was found to be contaminated. The contractor who is reroofing this building was alerted and arrangements were made for appropriate handling and disposal of these contaminated materials.

TRAINING AND EDUCATION

Seventy-eight employees of the Instrument Maintenance Department participated in one of three HP training sessions conducted by ORGDP-HP personnel. Twenty Maintenance Division trainees and 10 Cascade Operator trainees were given instructions in basic ORGDP-HP techniques and practices.

ROUTINE AND SPECIAL REQUEST SURVEYS

Twenty-seven field survey and radiation checks were performed. Sixty-one pieces of surplus equipment were checked, and 1293 pieces of decontaminated equipment or material were checked and tagged at K-1420.

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